Nov. 25, 1941. W. BAKER ET AL 2,264,231

EXCAVATING SHOVEL

Filed Feb. 13, 1939 3 Sheets-Sheet 1

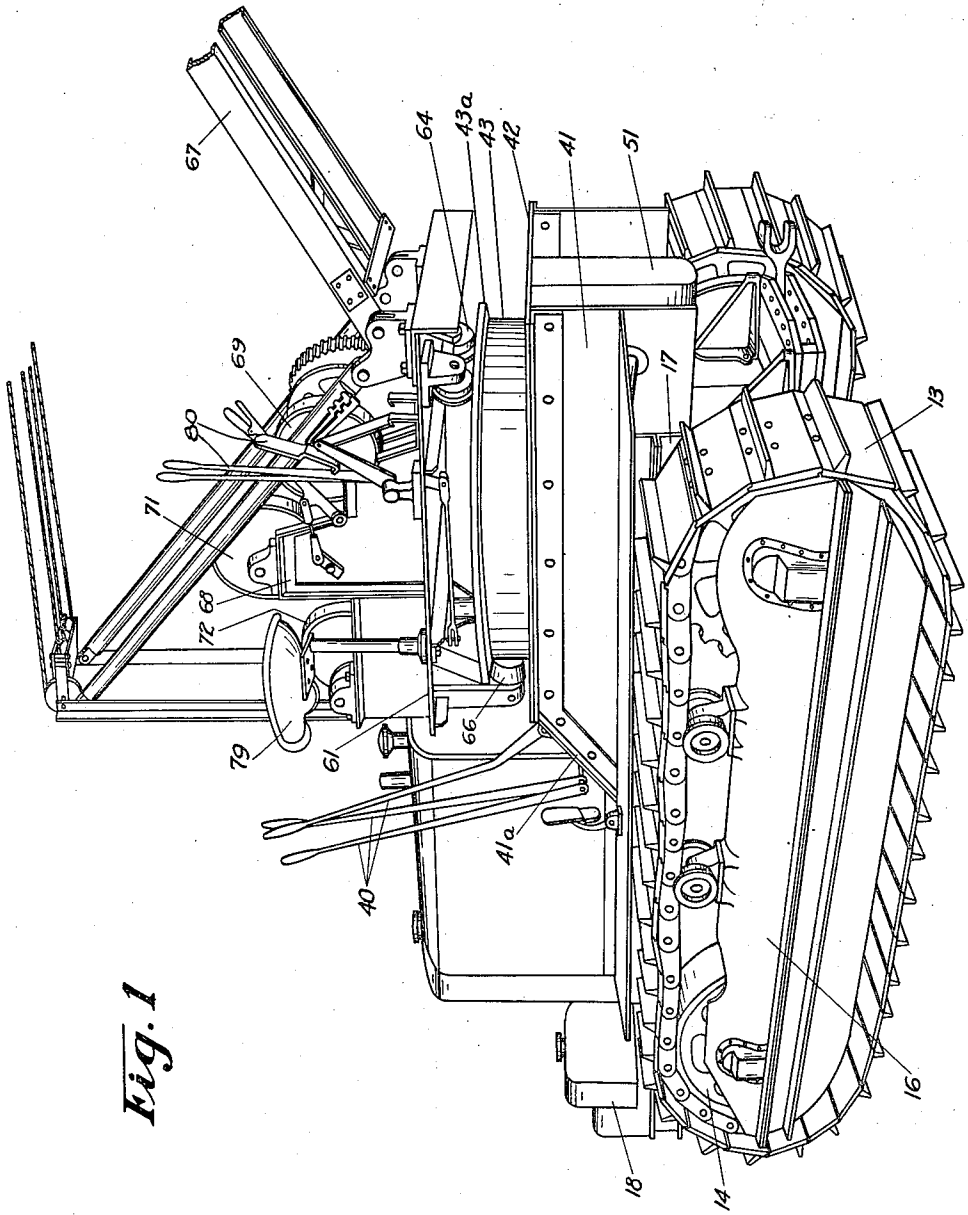


Fig. 1

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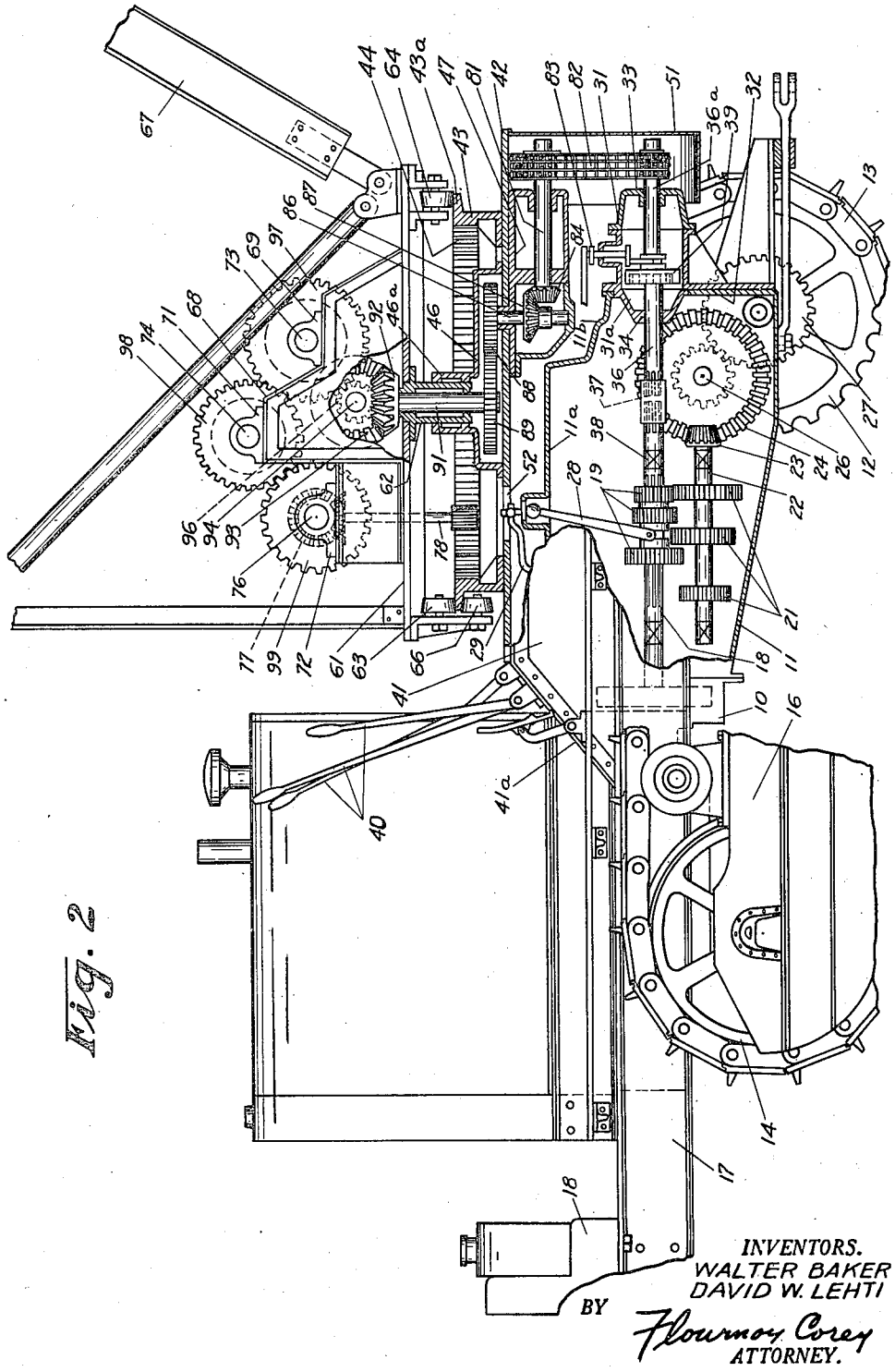


Fig. 2

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Filed Feb. 13, 1939 3 Sheets-Sheet 3

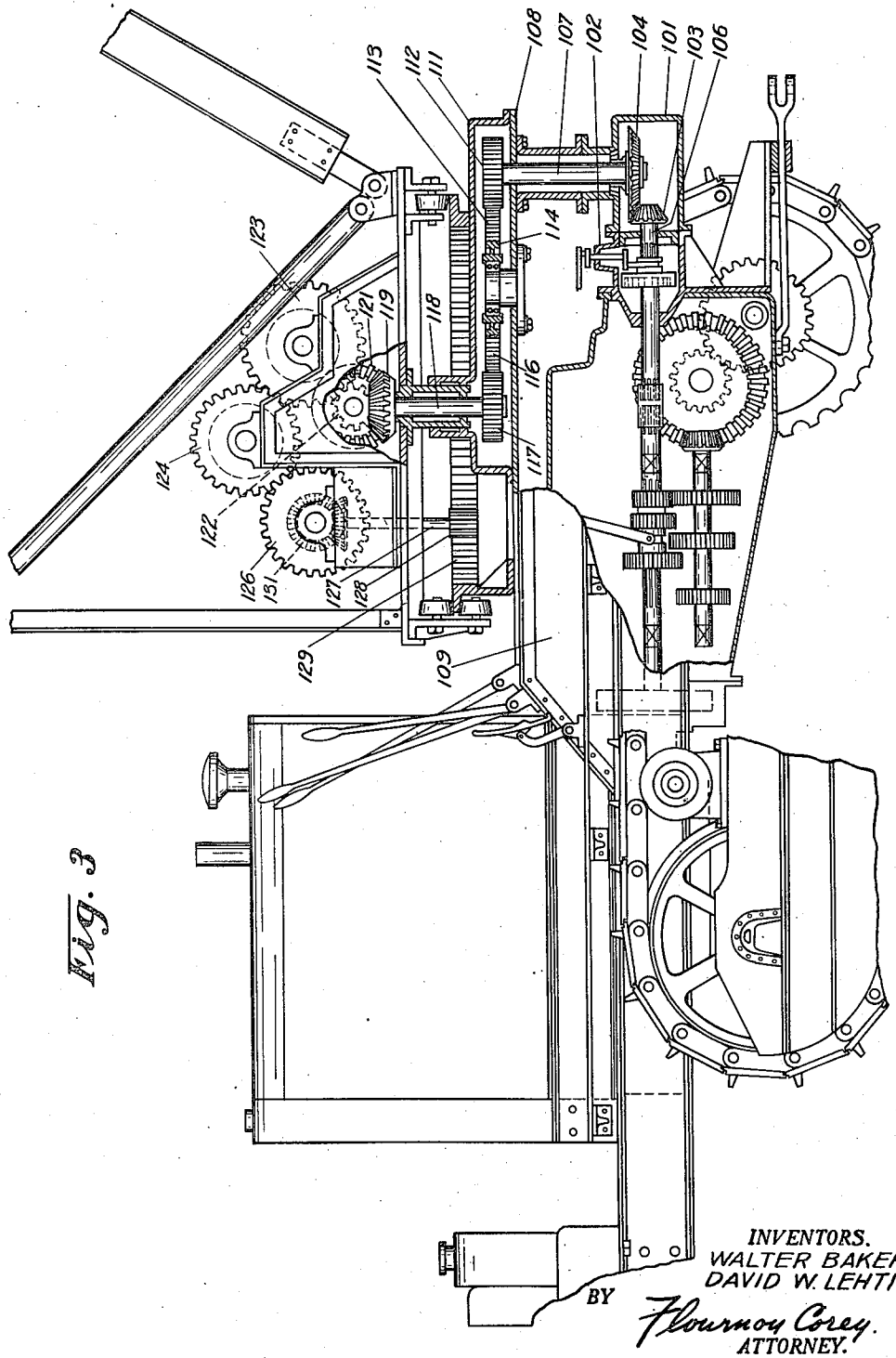


Fig. 3

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UNITED STATES PATENT OFFICE

2,264,231

EXCAVATING SHOVEL

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Application February 13, 1939, Serial No. 256,088

13 Claims. (Cl. 212—38)

This invention relates to earth moving devices and has particular relation to means for mounting an excavating shovel, a drag line scraper, or the like on a tractor, and means for driving the excavating device from the tractor motor.

While it is old in the art to mount an excavating shovel on a mobile base having motor driven endless tracks thereon, it is the usual practice to provide a specially constructed mobile base suitable for the one purpose and designed only for supporting and carrying the excavating shovel. In only a few instances has it been attempted to mount the excavating device on a standard tractor, and where this has been done, the turntable has been mounted so high above the tractor, in order to drive the excavating and turntable mechanism, that such devices are practically useless for excavating and serve only as a load carrying means, as for instance a shop crane or the like.

Several manufacturers are now building powerful tractors for use with snow plows, bulldozers, scrapers, trailbuilders, and trailers, and for hauling and operating dump wagons and the like. In these tractors the motor crank case and transmission crank case usually constitute the main frame of the tractor. The operator's seat is usually above the transmission case and he drives the tractor and steers it by means of levers mounted on the transmission case back of the motor.

These tractors are in an advanced stage of development and are manufactured in such quantities as to make them relatively low in price compared to the specially built structures ordinarily considered necessary for excavating shovels and the like. These tractors would make excellent bases for an excavating shovel from the standpoint of their low cost and reliability and because they can be used for other purposes such as snow plows and bulldozers, but the problem of mounting the turntable of an excavating device on one these tractors is a difficult one and is complicated by the desirability of providing a structure such that the excavating device may be quickly removed and the tractor restored to its usual form. It is difficult to mount a turntable of this character low enough on the tractor so that a drag line can be used and so that it can lift, shove and pull heavy loads. It is also difficult to provide means for driving the drums and turntable drive of such an excavating device.

It is, therefore, a general object of our invention to provide an excating shovel unit which may be mounted on the ordinary tractor and driven by power take-off means ordinarily supplied with such tractors, and to overcome the difficulties above enumerated.

It is also among the objects of our invention to provide a combination of ordinary tractor and excavating unit in which the operator may readily operate the tractor and the excavating unit from substantially the same position and in which he may have ready access to the control levers for both the tractor and the excavating device.

Other and further features and objects of the invention will be more apparent to those skilled in the art upon a consideration of the accompanying drawings and following specifications, wherein are disclosed several exemplary embodiments of the invention, with the understanding, however, that such changes may be made therein as fall within the scope of the appended claims, without departing from the spirit of the invention.

In said drawings:

Figure 1 is a view in perspective of a tractor, in which an excavating device constructed according to one embodiment of our invention, has been mounted.

Figure 2 is a diagrammatic view, partly in section and partly in elevation, illustrating one embodiment of our invention for mounting an excavating device on a tractor, and

Figure 3 is a diagrammatic view, partly in section and partly in elevation, showing another embodiment of our invention, and illustrating a modified means for driving the excavating device from the tractor motor.

Referring now to the drawings:

We have illustrated at 10 the crank case of a motor to the rear face of which is secured a tractor transmission case 11 on which the rear wheels 12 of the endless track running gear 13 are rotatably mounted. The tractor transmission case 11 and the motor transmission case in this showing constitute the main frame of the tractor, the front wheels 14 being rotatably mounted on subframes 16.

The channel members 17 are merely bolted to the sides of the tractor main frame and may be removed therefrom. These channel members support a counterweight 18 at the front of the tractor.

Drive of the rear wheels 12 is effected from the motor through the drive shaft 18, the change speed gearing drive gears 19, and, selectively, the change speed gearing driven gears 21. The driven gears 21 are mounted on a driven shaft

or pinion shaft 22 to drive pinion 23 which in turn drives the pinion gear 24 and axles 26. The axles 26 are provided with clutches and may be independently driven in accordance with the usual practice to drive gears 27 which in turn drive the rear wheels either together or independently as desired. Change of speed of drive is effected by means of the gear shifting lever 28 and shifting arm 29.

A casing or housing 31 is provided which may be detachably connected to the rear wall 32 of the transmission case, and this housing extends into the transmission case, as indicated at 31a. This housing 31 is provided with bearings 33 and 34 in which a power take-off shaft 36 is rotatably mounted. This power take-off shaft 36 may be detachably engaged by means of a sleeve 37 splined to an extension 38 of the drive shaft 18. A clutch 39 is provided for the shaft 36, the shaft 36 being really in two parts so that the clutch may be engaged or disengaged to drive the rear end 36a of the shaft 36.

A pair of substantially rectangular plates 41 are provided, which are secured to the sides of the transmission case and motor crank case. Sloping forward portions 41a of the rectangular plates provide a base on which the control levers 40 are mounted for pivotal movement.

The side plates 41 are detachable from the main frame of the tractor and these side plates support the deck plate 42 which extends across from one plate to the other and supports the turntable bull ring or bull gear 43. This turntable bull ring is provided with internal teeth, as indicated at 44 around the inner surface of the ring and near the upper edge thereof.

A gear housing 46 also is mounted on the deck plate 42 within the bull ring so that the upstruck portion 46a thereof is located at the center of the turntable gear 43. A bevel gear housing 47 is provided on the under rear face of the deck plate 42 and this housing is secured to the under side of the deck plate in any suitable manner, as by bolts or the like.

A drive chain housing 51 is also secured to the under side of the deck plate 42 rearwardly of the bevel gear housing 47, and this chain housing 51 is a close fit with both the housings 31 and 47.

The height of the side plates 41 are so chosen that the deck plate 42 is just as close as possible to the upper face 11a of the transmission 11 and, in fact, it is desirable to provide an opening 52 in the deck plate in order that the change speed shifting arm 29 may project through the plate.

The housing 47, which projects below the deck plate 42, is so located and shaped that the forward portion thereof is received in a recess 11b of the upper face 11a. The deck plate 42 is thus positioned as close as possible to the upper face 11a of the transmission case and the housings which house the turntable drive gearing are so positioned and formed as to be partially received in the recess in the rear upper wall of the transmission case.

The turntable or upper platform of the excavating device is illustrated generally at 61. The turntable 61 rotates on a quill shaft 62 which is rotatably received in the upwardly projecting portion 46a of housing 46. The turntable is supported for rotation by means of rollers 63 and 64 in accordance with the usual practice, and these rollers roll on a circular flange 43a of the bull ring 43. Other rollers 66 are provided to roll on the under side of the flange 43a at the opposite side of the turntable 61 from the boom 67, and these rollers prevent the turntable from tipping when a load is applied to the boom. A platform, indicated generally at 68, is provided on top of the turntable 61 and mounted above this platform are bearings or journal members 69, 71 and 72 in which are rotatably mounted the shafts 73 and 74 for the drums which operate the excavating device and the shaft 76 on which bevel gears 77 are mounted for driving the swing shaft 78, all this latter being in accordance with the usual practice.

The drive for driving the drums and swing shaft is affected by means of a "reverse turn" drive including a train of gearing, a chain and shafts which we are about to describe. A shaft 81 is rotatably mounted in housing 47 above and parallel to the shaft 36, and this shaft is driven by means of a chain drive 82 within the housing 51. The clutch 39 may be engaged and disengaged by means of the shifting means 83. A bevel gear 84 is provided on the forward end of the bevel gear drive shaft 81, and a bevel gear 86, mounted on a vertical drive shaft 87, is driven by the bevel gear 84 and carries the power up through the deck plate. 42. Spur gears 88 and 89 convey the power from the shaft 87 to a drive shaft 91, and this turntable drive shaft has a bevel gear 92 at the upper end thereof for driving another bevel gear 93. This bevel gear is mounted on a horizontal shaft 94 and spur gearing, indicated generally at 96, 97, 98 and 99 drive the drums and swing shaft in accordance with the usual practice.

The operator's seat 79 is mounted above the turntable 61 and at one side thereof so that, when the hoisting, excavating or other equipment mounted on the turntable is in the best position for permitting movement of the tractor from one position to another, the operator's seat will be in a position as shown in Figure 1 to permit the operator to manipulate the engine and traction controls 40. When the hoisting or other equipment is being used, the operator leaves the tractor engine running, swings his seat 79 around so as to face the control levers and foot pedals indicated generally at 80. These control members are, of course, connected with clutches in any suitable manner to afford control of the turntable swingshaft, and all cable or hoisting drums.

In another embodiment of the invention, illustrated in Figure 3, we provide a bevel gear housing 101 on the rear face of a turntable drive housing 102, corresponding to the housing 31 of Figure 2, and bevel gears 103 and 104 convey the power from the take-off shaft 106 to a vertical shaft 107. The deck plate 108 is supported on side plate 109 and a spur gear housing 111 is secured to the upper face of the deck plate. A train of spur gears 112, 113, 114, 116, and 117 convey power from the vertical shaft 107 to a turntable drive shaft 118. This train of gears is positioned for the most part, within the confines of the bull ring but extends outwardly through an opening in the side wall of the bull ring to the vertical drive shaft 107.

The drive shaft 118, through the agency of bevel gears 119 and 121, drives the train of spur gears indicated at 122, 123 and 124 to drive the crowd drum and lifting drum of the excavating device. The swing shaft 127 is driven from the spur gear 126 which is in mesh with the spur gear 124. Bevel gearing, indicated at 131, and suitable clutches in accordance with the usual practice, rotate the swing shaft 127 in one direction or the other to rotate the pinion 128 clockwise or

counterclockwise to rotate the turntable through the bull gear 129.

It is apparent that we have provided means for supporting an excavating device or the like on a conventional tractor in such manner that the turntable of the device is as close as possible to the upper face of the transmission case of the tractor in order to lower the center of gravity of the excavating device and in order to provide the lowest possible point for using a drag line or the like. It is also apparent that we have provided a simple and desirable means for driving the excavating device from the power take-off of the tractor. The entire excavating device may be removed from the tractor within the period of a few hours and the entire device restored to its original form as a conventional tractor. The excavating device is easily added to the tractor without material change thereof.

Although we have described several specific embodiments of our invention, it is apparent that modifications thereof may be made by those skilled in the art. Such modifications may be made without departing from the spirit and scope of our invention as set forth in the appended claims.

We claim as our invention:

1. In an excavating device including a tractor having an engine, a transmission case and drive wheels mounted for rotation on this transmission case, a turntable mounted for rotation on an axis which, if extended, passes downwardly through the transmission case, a turntable drive shaft, for driving mechanisms disposed above the turntable, coaxial with the axis of the turntable, a power take-off extending through the rear face of the transmission case, means for transmitting power upwardly from the power take-off including a bevel gear on the power take-off, a vertical shaft having a bevel gear meshing with the gear on the power take-off, and a train of spur gearing extending horizontally forward from the vertical shaft to the turntable shaft, at least a part of the said train of spur gearing being disposed within the confines of the turntable whereby the turntable may be mounted close above the transmission case and below the top of the engine to keep the center of gravity low and promote stability.

2. In an excavating device, a tractor, a transmission case and drive wheels mounted for rotation on this transmission case, a bull ring mounted above the transmission, a turntable mounted for rotation on an axis which intersects the transmission, a drive shaft coaxial with the axis of the turntable and bull ring, a power take-off extending through the rear face of the transmission case, means for transmitting power vertically up the rear face of the transmission case including sprockets and a chain extending vertically from the power transmission take-off upwardly along the rear face of the transmission case, a horizontal forwardly extending shaft on which the sprocket is mounted, bevel gearing for changing the axis of revolution of the driving means to a vertical axis from the horizontal shaft, and spur gearing for transmitting the power horizontally forward to the turntable drive shaft.

3. In a tractor-mounted excavating device, a transmission case comprising the rear end of the tractor frame, rear drive wheels mounted for rotation on the sides of the transmission case, a power take-off extending through the rear wall of the transmission case, a bull ring mounted closely and vertically adjacent the top of the transmission case, a turntable mounted to rotate thereon, a drive shaft extending vertically through the axis of rotation of the turntable, and means for driving the vertical drive shaft from the power take-off including a horizontally positioned train of gearing located substantially within the bull ring.

4. In an excavating device, a tractor, the rear end thereof including a transmission case, rear drive wheels mounted for rotation thereon, a power take-off extending rearwardly from the transmission case, a platform mounted closely adjacent the top of the transmission case, a bull ring mounted thereon vertically above the transmission case, a turntable rotatably mounted on the bull ring with the axis of rotation thereof passing downwardly through the transmission case, a drive shaft extending vertically through the axis of rotation, and means for driving the vertical drive shaft from the power take-off including a train of gearing operating in a horizontal plane and positioned substantially within the bull ring.

5. In an excavating device, a tractor, the transmission case thereof forming the rearmost part of the tractor frame, a platform mounted immediately above the transmission case, a power take-off extending rearwardly from the transmission, a vertical shaft extending through the platform, means for driving said shaft from the power take-off, a bull ring mounted on the platform with the axis thereof forward from the vertical shaft, a turntable mounted for rotation on the bull ring, a vertical drive shaft passing from the platform upwardly through the axis of rotation of the turntable, and means positioned within the bull ring for driving said vertical drive shaft at reduced speed from the vertical shaft for providing a constant source of power above the turntable.

6. In an excavating device, a tractor having a transmission case extending to the rear thereof, a platform mounted closely adjacent the top of the transmission case, a power take-off shaft extending rearwardly from the transmission case, a horizontal drive shaft above and parallel to the power take-off and extending between the platform and the transmission case, sprockets on both the drive shaft and the power take-off, a chain drive connecting said sprockets, an idler shaft extending upwardly through the platform, bevel gears for driving the idler shaft from the horizontal drive shaft, a bull ring mounted on the platform, a turntable mounted for rotation thereon, a vertical drive shaft extending from the platform upwardly through the axis of rotation of the turntable, and a train of gears located substantially within the confines of the bull ring and above the platform for driving the vertical drive shaft from the idler shaft.

7. In a device of the character described including a tractor having a motor and transmission case forming the main frame thereof, a turntable including a bull ring mounted immediately adjacent and above the transmission case and having the extended axis thereof passed downwardly through the transmission case, a shaft passing through the axis of the turntable, means for supplying power for rotating the shaft from the transmission comprising drive means extending rearwardly from the transmission, other transmission means extending upwardly at the rear of the transmission case from the first means, and still other power transmitting means connected to the upwardly extending means and extending forward to the vertical shaft, with at least a portion of the last named transmission

means comprising flat gearing in a horizontal plane disposed substantially within the bull ring of the turntable.

8. In a device of the character described, a tractor having a transmission case on which the rear axles are rotatably mounted, a bull ring above and substantially resting on the transmission case, a vertical shaft passing through the axis of the turntable, and means for furnishing power to rotate the shaft comprising a "reverse turn" drive leading out through the back of the transmission case, vertically upward at the rear of the transmission case, and forward to the vertical shaft, the forwardly extending portion including flat gearing disposed relatively close against the top of the transmission case so as to take the least possible valuable vertical space, and at least a portion of said gearing being located within the bull ring.

9. In a device of the character described, a tractor having a relatively low transmission case at the rear thereof and a power take-off extending from the rear of the transmission case, means for demountably supporting a platform close above the top of the transmission case, a bull ring mounted on the platform, a rotatable platform supported for rotation on the bull ring about the axis thereof, an upper platform drive shaft, means including a train of horizontally extending spur gearing disposed within the bull ring, and other driving means extending rearwardly over the back of the transmission case and downwardly to connect with the power take-off for driving the upper platform drive shaft.

10. In a device of the character described including a tractor having a relatively low transmission case at the rear thereof and a power take-off extending from the rear of the transmission case, means for demountably supporting a platform close above the top of the transmission case, a bull ring mounted on the platform, an upper platform supported for rotation on the bull ring about the axis thereof, a drive shaft extending upwardly axially through the bull gear and upper platform, means including a train of horizontally extending spur gearing disposed within the bull ring, and other driving means extending rearwardly over the back of the transmission case and downwardly to connect with the power take-off for driving the drive shaft, a swing shaft and hoisting drums mounted on the rotatable upper platform and means for operatively connecting the swing shaft and hoisting drums with the said drive shaft.

11. In a device of the character described, a tractor including a transmission case comprising the rear end thereof and having a rear power take-off, a turntable rotatable above the transmission case and means for mounting the turntable close above the upper surface of the transmission case, whereby a low center of gravity of the turntable may be provided, said mounting means including a lower platform demountably supported close above the upper surface of the transmission case, a bull ring supported on the said lower platform for supporting the rotatable turntable, a power transmission shaft extending upwardly through the axis of rotation of the turntable, a train of horizontally disposed spur gear members positioned within the bull ring and connected with the power transmission shaft, and other driving members connecting the train of gear members with the power take-off and extending rearwardly along the upper surface of the transmission case to a point beyond the rear wall thereof and then downwardly to the power take-off.

12. In an excavating device, a tractor having a transmission case extending rearwardly of and partly enclosing the rear axle of the tractor, a power take-off extending through the rear wall of the transmission, a bull ring having a bull gear thereon, a turntable and a drive shaft mounted to rotate about a vertical axis, the position of the turntable being just above the top wall of the transmission case with the axis of the turntable and the drive shaft extending vertically forward of the rear axle to promote stability of the machine by placing the load of the turntable just above the top of the transmission case and forward of the rear axle, and drive means for driving the turntable drive shaft from the power take-off shaft comprising a power transmission means extending upwardly just to the rear of the rear wall of the transmission case to a point above and rearwardly of the transmission case and then forwardly between the top of the bull gear and the top of the transmission case and to the drive shaft.

13. In an excavating device including a tractor having an engine, a transmission case and drive wheels mounted for rotation on the transmission case, a turntable mounted for rotation on an axis which intersects the transmission case, a drive shaft, for driving mechanisms disposed above the turntable, coaxial with the axis of the turntable, a power take-off extending through the rear face of the transmission case, means for transmitting power upwardly from the power take-off including a bevel gear on the power take-off, a vertical shaft having a bevel gear meshing with the gear on the power take-off, and a train of spur gearing extending horizontally forward from the vertical shaft to the drive shaft, at least a part of the said train of spur gearing being disposed within the confines of the bull ring whereby the turntable may be mounted close above the transmission case and below the top of the engine to keep the center of gravity low and promote stability.

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